*Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_*

# Ecosystems

The table describes some common terms used to describe living things in their environment.

| **Term** | **Description** |
| --- | --- |
| Environment | All the conditions that surround a living organism |
| Habitat | The place where an organism lives |
| Population | All the members of a single species that live in a habitat |
| Community | All the populations of different organisms that live together in a habitat |
| Ecosystem | A community and the habitat in which it lives |
|  |  |



Each zone of this oak tree is home to a distinctive community of organisms.

## Biodiversity

**Biodiversity** is the variety of different species living in a habitat. The greater the number of different species in a habitat, the greater its biodiversity.

Some ecosystems are natural and others are artificial. For example:

##

| **Natural** | **Artificial** |
| --- | --- |
| Native woodland | Forestry plantation |
| Lake | Fish farm |

Natural ecosystems are likely to have a larger biodiversity than artificial ecosystems. For example, a lake may contain many species of fish but a fish farm may only have one species.

**Food chains**

Food chains show the feeding relationships between living things. Pyramids of biomass reveal the mass of living material at each stage in a chain. The amount of material and energy decreases from one stage to the next. Food production is more efficient if the food chain is short, or if energy losses from animals are reduced.



A food chain shows what eats what in a particular habitat. For example, grass seed is eaten by a vole, which is eaten by a barn owl. The arrows between each item in the chain always point in the direction of energy flow - in other words, from the food to the feeder.

A food chain shows how energy is **passed on** from one organism to another. The original source of energy is the Sun, which in this example provides the **sunlight** needed by the grass for **photosynthesis**. The grass is the **producer** in this food chain. The vole and the owl are **consumers**.

It helps if you can recall the meaning of some common words used with food chains.

**Common words used with food chains and their meaning**

| **Word** | **Meaning** |
| --- | --- |
| **Producers** | Green plants - they make food by photosynthesis. |
| **Primary consumers** | Usually eat plant material - they are herbivores. For example rabbits, caterpillars, cows and sheep. |
| **Secondary consumers** | Usually eat animal material - they are carnivores. For example cats, dogs and lions. |
| **Predators** | Kill for food. They are either secondary or tertiary consumers |
| **Prey** | The animals that predators feed on. |
| **Scavengers** | Feed on dead animals. For example, crows, vultures and hyenas are scavengers. |
| **Decomposers** | Feed on dead and decaying organisms, and on the undigested parts of plant and animal matter in feces. |

# Energy transfer

Energy is transferred along food chains from one stage to the next. But not all of the energy available to organisms at one stage can be absorbed by organisms at the next one. The amount of available energy decreases from one stage to the next.

Some of the available energy goes into growth and the production of offspring. This energy becomes available to the next stage, but most of the available energy is used up in other ways:

* energy released by respiration is used for movement and other life processes, and is eventually lost as heat to the surroundings
* energy is lost in waste materials, such as feces

All of the energy used in these ways returns to the environment, and is not available to the next stage.

**The carbon cycle**

All cells - whether animal, plant or bacteria - contain **carbon**, because they all contain proteins, fats and carbohydrates. Plant cell walls, for example, are made of cellulose - a carbohydrate.

Carbon is passed from the atmosphere, as carbon dioxide, to living things, passed from one organism to the next in complex molecules, and returned to the atmosphere as carbon dioxide again. This is known as the carbon cycle.

**Removing carbon dioxide from the atmosphere**

Green plants remove carbon dioxide from the atmosphere by photosynthesis. The carbon becomes part of complex molecules such as proteins, fats and carbohydrates in the plants.

**Returning carbon dioxide to the atmosphere**

Organisms return carbon dioxide to the atmosphere by respiration. It is not just animals that respire. Plants and microorganisms do, too.

**Passing carbon from one organism to the next**

When an animal eats a plant, carbon from the plant becomes part of the fats and proteins in the animal. Microorganisms and some animals feed on waste material from animals, and the remains of dead animals and plants. The carbon then becomes part of these microorganisms and detritus feeders.

The slideshow should help you to understand how the cycle works.

 

 

Materials from living things decay because they are digested by microorganisms. This process happens faster in warm, moist conditions with plenty of oxygen. Decay can be very slow in cold, dry conditions, and when there is a shortage of oxygen.

**Nitrogen cycle**

Nitrogen is essential for the formation of **amino acids** in proteins. The **nitrogen cycle** is a model that explains how nitrogen is **recycled**.

There's lot of nitrogen in **air** – about **78%** of the air is nitrogen. Because nitrogen is so **unreactive**, it cannot be used directly by plants to make protein. Only **nitrates** are useful to **plants**, so we are dependent on other processes to **convert** nitrogen to nitrates in the soil.

The Nitrogen Cycle:

 

 



1. Nitrogen gas is converted to nitrate compounds by **nitrogen-fixing bacteria** in soil or root nodules. **Lightning** also converts nitrogen gas to nitrate compounds. The Haber process converts nitrogen gas into ammonia used in fertilizers. Ammonia is converted to nitrates by **nitrifying bacteria** in the soil.
2. Plants absorb nitrates from the soil and use these to build up **proteins**. The plant may be eaten by an **animal**, and its biomass used to produce **animal protein**.
3. Urea and egested material is broken down by **decomposers**. This results in nitrogen being returned to the soil as **ammonia**.
4. Decomposers also break down the **bodies** of dead organisms resulting in nitrogen being returned to the soil as ammonia.
5. In some conditions **denitrifying bacteria** in the soil break down nitrates and return nitrogen to the air. This is usually in **waterlogged soil**. Improving drainage reduces this effect, making the soil more fertile.

**References:**

http://www.bbc.co.uk/schools/gcsebitesize/science/add\_aqa\_pre\_2011/foodchains/foodchains1.shtml

http://www.bbc.co.uk/schools/gcsebitesize/science/add\_gateway\_pre\_2011/greenworld/energyflowrev1.shtml

http://www.bbc.co.uk/schools/gcsebitesize/science/add\_ocr\_gateway/green\_world/ecologyrev1.shtml

1. What is an ecosystem?
	1. a community and its habitat
	2. a group of organisms and their predators
	3. all the organisms in a food chain
	4. where an organism lives
2. The diagram shows a short food chain: grass, rabbit, fox In the food chain, what is the importance of the rabbit?
	1. It absorbs carbon dioxide.
	2. It absorbs the Sun’s energy.
	3. It passes on energy from plants.
	4. It releases oxygen.
3. The diagram shows a food chain. What does the empty box represent?



* 1. consumer
	2. decomposer
	3. photosynthesis
	4. producer
1. The diagram shows part of the carbon cycle in a forest. The numbers represent different processes. Which of these processes is reduced in rate as a result of deforestation?



* 1. 1 only
	2. 1 and 2 only
	3. 2 and 3 only
	4. 1, 2 and 3
1. Explain your answer in #4
2. The figure below shows a food web for a freshwater pond.



* 1. Two trophic levels are listed below. For each level, state **two** examples from the figure. Identify them by **number**.
		1. Primary consumers (herbivores)
		2. Secondary consumers (carnivores)
	2. Using the numbers in the figure above, construct a simple food chain with **five stages**.
1. South Uist is a small island which provides one of the few remaining summer habitats for a bird called the Corncrake (*Crex crex*). It lives in hay fields where it feeds on insects worms and seeds. South Uist provides a good habitat because there are plenty of hay fields where the Corncrake can nest and there are few predators.

However, a small mammal called the Hedgehog (*Erinaceus europaeus*) was released onto the island. The Hedgehog also has few natural predators and will feed on the eggs of Corncrakes, as well as on insects and worms. The number of Hedgehogs on South Uist has risen rapidly to 10,000 while Corncrakes are becoming endangered as their numbers worldwide are falling.

* 1. State **three** reasons why South Uist provides a good habitat for Corncrakes.
	2. Explain why Corncrakes are becoming endangered by Hedgehogs.
	3. Draw a food web to show the feeding relationships described in the passage. Assume the insects and worms feed on leaves.
	4. Suggest **two** ways the extinction of the Corncrakes could be avoided.
1. The figure below shows a food web which includes some organisms in the African grasslands.



* 1. In the space below, draw a food chain consisting of **four** organisms. The organisms must be part of the food web.
	2. Using examples from the food web, explain the differences between producers and consumers.

Refer to the drawing for the following questions.



1. Which arrow represents photosynthesis?
	1. A
	2. B
	3. C
2. Which arrow represents respiration?
	1. A
	2. B
	3. C
3. Which arrow represents decomposition?
	1. A
	2. B
	3. C
4. Which process converts nitrogen in protein into ammonia?
	1. Feeding
	2. Excretion
	3. Decomposition
5. Which process converts nitrogen in plant protein into animal protein?
	1. Feeding
	2. Excretion
	3. Decomposition